Introduction

When producing code, programmers can sometimes feel as though they are going around in circles. In some cases, this is exactly what they need to accomplish.

As with a Ferris wheel ride, you need to know how many revolutions are needed and how to stop when the ride is over. When riding a Ferris wheel, unplanned things can happen, so the operator needs to know how to safely stop the wheel and figure out what went wrong.

Hersheypark Ferris Wheel

Source: Wikimedia Commons

The Ferris wheel operator also needs to make decisions on selecting who can and who cannot ride. These decisions are based on rules which are important to follow. As with the Ferris wheel example, there are times when computer programs may need to combine looping and selection actions to ensure a program operates correctly and provides the intended results.

This module is part one of **control statements** with an overview on **conditional iterations and repetition statements**.

Topics and Learning Objectives

Topics

- Count-controlled loops (definite iterations)
- Condition-controlled loops (indefinite iterations)
- Loops inside loops (nested iterations)

Learning Objectives

By the end of the module, you will be able to:

- Differentiate between definite, indefinite, and nested iterations.
- Discuss the possibility of converting a count-controlled loop to a condition-controlled loop, and vice-versa.
- Execute a loop to repeat a sequence of actions a finite number of times.
- Employ the inner-and-outer loops to traverse elements inside other elements.

Readings

Required Readings

- Lambert, K. A. (2019). *Fundamentals of Python: First programs* (2nd ed.). Boston, MA: Cengage Learning.
    - Loops and Selection Statements, pages 64–72, 86–101

Program Looping

This module examines different types of looping and control routines—the "**for**" and "**while**" loops. Each provides various ways to control the flow of a program.

You will discover the main differences between these two control routines as well as various ways they can be modified using control statements and variables. You will also learn about statement syntax rules, program structure, flow and related terminology. When building loops, an error in logic may occur causing the loop to never end, or never start. The module will present ways to debug and isolate potential trouble spots so that you can test the logic of your code to ensure it runs as intended.

As you study this part of the module, it may help to think about everyday situations in life where "for" and "while" loops occur. Consider each situation and how it would be impacted by either type of loop. In other words, which type of loop is best for the situation and why. For example, getting dressed for the day, eating lunch, walking.

Approaching the module topic in this less technical way may help you to visualize the operation of the programs you will work with and build.

Common Problems

Here are a few common problems that can occur when building program loops. Knowing how to prevent them is important. Developing good troubleshooting and debugging techniques is also important.

- Program stuck in an infinite loop
- Program crashes with error message
- Program generates the wrong results
- No output is generated

Definite Iterations

The count-controlled loops are loops that iterate through a specific range of numbers. These loops can be used to repeat a sequence of actions a fixed number of times, traverse a sequence of characters in a string or a complex data structure, such as a list to a set, or they can be used to count up or down from an initial value to a final limit.

Watch this video to learn about the structure and syntax of these types of loops, and how to use the simple **range()** function or the extended version of it to determine the range of the values. Illustrative examples are provided along with their control flows and run-time execution.

Ryecast Video:

Download

Download the PDF file for **CIND830 - Module 3: Repetition Statements** and click on the topic "**Definite Iterations**" in the top navigation bar in the header to take you to the beginning of this topic. Please note this PDF file will be used in all three videos of this module.

Download the **CIND830 - Module 3: Definite Iterations transcript**.

Indefinite Iterations

The indefinite iterations or the condition-controlled loops are those loops that iterate without knowing in advance the number of times the loop will be executed. These loops can be used to process data from a file without knowing in advance the end of that file, traverse a sequence of actions while a certain condition remains true, or they can be used to count up/down from an initial value until a given condition changes.

Watch this video to learn about the structure and syntax of these types of loops, and how to use conditional while-loops to process data or traverse a set of statements. Illustrative examples are provided along with their control flows and run-time execution.

Ryecast Video:
CIND830 - Module 3: Indefinite Iterations

Download

Download the PDF file for **CIND830 - Module 3: Repetition Statements** and click on the topic "**Indefinite Iterations**" in the top navigation bar in the header to take you to the beginning of this topic.

Download the **CIND830 - Module 3: Indefinite Iterations transcript**.

Nested Iterations

Nested iterations or nested loops are loops that iterate within other loops. These types of loops can be used to repeat a sequence of actions inside another loop, traverse a set of strings and at the same time for each string, they count how many times a certain character is found. These loops require an inner and outer loop.

Watch this last video to learn about the structure and how to design a nested loop. Illustrative examples are provided along with their control flows and run-time execution.

Ryecast Video:
CIND830 - Module 3: Nested Iterations

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Download the PDF file for **CIND830 - Module 3: Repetition Statements** and click on the topic "**Nested Iterations**" in the top navigation bar to take you to the beginning of this topic.

Download the **CIND830 - Module 3: Nested Iterations transcript**.

Self-Assessment Quiz

Please complete the following review activity. The activity is not graded.

Matching Exercise:
Self-Assessment Matching Exercise

Test Yourself

H5P Object:
Self-Assessment Quiz

Summary

In this module, we covered three topics: definite iterations, indefinite iterations, and nested iterations. We learned how to write a loop that repeats a sequence of actions a fixed number of times using the for-loop. We also saw how to specify the loop iterator and the range of values with which we can start and end our loop. We also learned how to write a conditional loop that halts when a condition becomes "False." Finally, we gave an example of outer and inner loops, where we traversed a sentence and counted the number of letters of each word inside that sentence.

Activities

Discussion

Module 3 Discussion

This week, let's discuss conditional iterations and repetition statements in the **Module 3 Discussion** topic in D2L under the **Communication** drop-down menu, then **Discussions**. Feel free to start a new thread or respond to someone else's post.

Lab Activity

Lab 2

Before starting Lab 2, be sure you have reviewed all the content in Module 3. The lab is a practical extension to apply your knowledge gained from this module. Download Lab 2 now and complete it by the end of this week. Your instructor will give you time to work on it before releasing the solutions in a folder called **Lab Solutions** in D2L under the **Course Materials** drop-down menu for you to verify your answers. The lab activity is not graded.

While working on your lab, post any questions, ideas, and strategies in the **Module 3 Discussion** topic in D2L. Feel free to read and respond to your peers' posts as well. You may also have the option of reaching out to your instructor during his/her virtual office hours.

Please note: The PDF for the lab activity may not be fully accessible for students who use assistive technology. If you require an accessible version, please contact your instructor.

Assessments

Quiz Module 3

Please go to your D2L course shell, under the **Assessment** drop-down menu, and select **Quizzes**. Then, click on the **Quiz Module 3 link** and follow the instructions to complete this quiz. The date and length of time have been set for this quiz. **This quiz is a cumulative 10% of your final grade**.

Reminder

Continue working on **Assignment 1 (worth 15% of your final grade)**, due by the end of Module 5.

While you are working on this assignment, feel free to share your questions, ideas, and strategies in the **Assignment 1 Discussion** topic in D2L.

References

- Lambert, K. A. (2019). *Fundamentals of Python: First programs* (2nd ed.). Boston, MA: Cengage Learning.
- Tutorialspoint. (n.d.). Python – Loops. Learn Python programming language. Retrieved from https://www.tutorialspoint.com/python/python_loops.htm